

CLAIMS

1. An ink jet recording apparatus which includes an ink jet head whose recording-medium opposing surface that opposes a recording surface of a recording medium is furnished with an ink ejecting portion formed with open ends of a plurality of nozzle holes for ejecting a UV curable ink, and a head moving mechanism for putting the ink jet head
5 into reciprocating motion in a predetermined direction parallel to the recording surface of the recording medium, and which performs recording by ejecting the ink from the nozzle holes of the ink jet head onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by
10 irradiation with ultraviolet light, at least when the head moving mechanism puts the ink jet head into a forward motion of the reciprocating motion,

wherein the ink jet head or a moving member which moves together with the ink jet head is provided with a plurality of ultraviolet light emitting diodes for emitting the ultraviolet light to the ink attached onto the recording surface of the recording medium to
15 cure the ink.

2. The ink jet recording apparatus of claim 1, wherein the ultraviolet light emitting diodes, when seen from a direction perpendicular to the recording surface of the recording medium, are arranged to form one or a plurality of linear rows that extend in a direction
20 perpendicular to the direction of the reciprocating motion of the ink jet head.

3. The ink jet recording apparatus of claim 2, wherein the ultraviolet light emitting diodes form the plurality of rows.

25 4. The ink jet recording apparatus of claim 3, wherein each ultraviolet light

emitting diode in each ultraviolet-light-emitting-diode row is disposed in a position corresponding to the middle position between two adjacent ultraviolet light emitting diodes arranged in a neighboring one of the ultraviolet-light-emitting-diode rows, so that the ultraviolet light emitting diodes in the two adjoining ultraviolet-light-emitting-diode rows
5 form a zigzag pattern.

5. The ink jet recording apparatus of claim 2, wherein the open ends of the nozzle holes are arranged in the ink ejecting portion to form at least one or a plurality of linear rows that extend in a direction perpendicular to the direction of the reciprocating motion of
10 the ink jet head, and

the number of the ultraviolet light emitting diodes arranged in each ultraviolet-light-emitting-diode row is smaller than the number of the nozzle hole open ends existing in each nozzle-hole-open-end row.

15 6. The ink jet recording apparatus of claim 2, wherein the open ends of the nozzle holes are arranged in the ink ejecting portion to form at least one or a plurality of linear rows that extend in a direction perpendicular to the direction of the reciprocating motion of the ink jet head, and

the ultraviolet light emitting diodes existing on both ends of each ultraviolet-light-emitting-diode row are positioned outwardly of the nozzle hole open ends existing on both
20 ends of each nozzle-hole-open-end row with respect to the direction of the nozzle-hole-open-end row.

7. The ink jet recording apparatus of claim 2, wherein the length, in the direction
25 of the ultraviolet-light-emitting-diode rows, of a portion of the recording surface of the recording medium on which recording is performed in a single forward motion of the ink

jet head is smaller than the length, in the direction of the ultraviolet-light-emitting-diode rows, of a portion of the recording surface of the recording medium which can be irradiated with ultraviolet light emitted from all of the ultraviolet light emitting diodes during the single forward motion.

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8. The ink jet recording apparatus of claim 2, wherein a pattern mask is provided between the ultraviolet light emitting diodes and the recording medium so as to reduce difference in illumination of ultraviolet light on the recording surface of the recording medium between a portion of the recording surface which corresponds to the middle position between any two adjacent ultraviolet light emitting diodes in each ultraviolet-light-emitting-diode row and portions of the recording surface which correspond to the positions of those two ultraviolet light emitting diodes.

9. The ink jet recording apparatus of claim 1, wherein the apparatus is configured so that the ultraviolet light emitted from the ultraviolet light emitting diodes is applied via a light guiding member to the ink attached to the recording medium.

10. The ink jet recording apparatus of claim 1, wherein the apparatus is configured so that each time the ink jet head performs a forward motion and a backward motion of the reciprocating motion, the ink is ejected from the nozzle holes of the ink jet head onto the recording surface of the recording medium so as to perform recording, and

the ultraviolet light emitting diodes are disposed at both sides of the ink ejecting portion with respect to the direction of the reciprocating motion of the ink jet head.

11. The ink jet recording apparatus of claim 10, wherein the apparatus is

configured so that in each of the forward and backward motions of the ink jet head, at least the ultraviolet light emitting diodes rearward of the ink ejecting portion with respect to the moving direction of the ink jet head emit the ultraviolet light.

5 12. The ink jet recording apparatus of claim 1, wherein the apparatus is configured so that only when the ink jet head performs a forward motion of the reciprocating motion, the ink is ejected from the nozzle holes of the ink jet head onto the recording surface of the recording medium so as to perform recording, and

the ultraviolet light emitting diodes are disposed rearward of the ink ejecting
10 portion with respect to the direction of the forward motion of the ink jet head.

13. The ink jet recording apparatus of claim 1, wherein the nozzle holes are formed in a nozzle plate which forms the recording medium opposing surface of the ink jet head, and

15 the ultraviolet light emitting diodes are disposed on the nozzle plate.

14. The ink jet recording apparatus of claim 1, wherein the nozzle holes are formed in a nozzle plate which forms the recording medium opposing surface of the ink jet head, and

20 the ultraviolet light emitting diodes are disposed on a member other than the nozzle plate.

15. The ink jet recording apparatus of claim 1, wherein the apparatus is configured so that the ultraviolet light emitting diodes are placed in a case and that the ultraviolet light
25 is emitted through a surface of the case.

16. The ink jet recording apparatus of claim 15, wherein the case is disposed so that the ultraviolet light emitting surface thereof is in the same plane as the recording medium opposing surface of the ink jet head.

5 17. The ink jet recording apparatus of claim 15, wherein the case is disposed so that the ultraviolet light emitting surface thereof is located closer to the recording medium than the recording medium opposing surface of the ink jet head is.

10 18. The ink jet recording apparatus of claim 15, wherein the case is disposed so that the ultraviolet light emitting surface thereof is located farther from the recording medium than the recording medium opposing surface of the ink jet head is.

15 19. The ink jet recording apparatus of claim 15, wherein the case is disposed at least rearward of the ink ejecting portion with respect to the direction of the forward motion of the ink jet head, and

the ultraviolet light emitting surface of the case is tilted with respect to the recording medium opposing surface of the ink jet head so that the side of the ultraviolet light emitting surface closer to the ink ejecting portion is located closer to the recording medium than the opposite side of the case is.

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20. The ink jet recording apparatus of claim 15, wherein the case is disposed at least rearward of the ink ejecting portion with respect to the direction of the forward motion of the ink jet head, and

a light blocking member for preventing part of the ultraviolet light emitted by the
25 ultraviolet light emitting diodes from reaching the ink ejecting portion is provided between

the case and the ink ejecting portion.

21. The ink jet recording apparatus of claim 1, wherein a heat conduction member for conducting, to the ink within the ink jet head, heat produced by the emission by the
5 ultraviolet light emitting diodes is provided.

22. The ink jet recording apparatus of claim 1, wherein a radiator for dissipating heat produced by the emission by the ultraviolet light emitting diodes is provided.

10 23. The ink jet recording apparatus of claim 1, further comprising a recording medium moving mechanism for moving the recording medium in a direction perpendicular to the direction of the reciprocating motion of the ink jet head and parallel to the recording surface of the recording medium, and

a discharge lamp disposed frontward of the ink jet head with respect to the moving
15 direction of the recording medium and capable of applying ultraviolet light to an entire recording area of the recording surface of the recording medium with respect to the direction of the reciprocating motion of the ink jet head.

24. An ink jet recording apparatus which includes a recording medium moving
20 mechanism for moving a recording medium in a predetermined direction parallel to a recording surface of the recording medium, and an ink jet head which extends in a direction perpendicular to the moving direction of the recording medium and parallel to the recording surface of the recording medium and whose recording-medium opposing surface that opposes the recording surface of the recording medium is furnished with an ink
25 ejecting portion formed with open ends of a plurality of nozzle holes for ejecting a UV

curable ink; and which performs recording by ejecting the ink from the nozzle holes of the ink jet head onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by irradiation with ultraviolet light, with the recording medium being moved by the recording medium
5 moving mechanism,

wherein the ink jet head or a member disposed in the vicinity of the ink jet head is provided with a plurality of ultraviolet light emitting diodes for emitting the ultraviolet light to the ink attached onto the recording surface of the recording medium to cure the ink.

10 25. The ink jet recording apparatus of claim 24, wherein the ultraviolet light emitting diodes, when seen from a direction perpendicular to the recording surface of the recording medium, are arranged to form one or a plurality of linear rows that extend in the length direction of the ink jet head.

15 26. The ink jet recording apparatus of claim 25, wherein the ultraviolet light emitting diodes form the plurality of rows.

20 27. The ink jet recording apparatus of claim 26, wherein each ultraviolet light emitting diode in each ultraviolet-light-emitting-diode row is disposed in a position corresponding to the middle position between two adjacent ultraviolet light emitting diodes arranged in a neighboring one of the ultraviolet-light-emitting-diode rows, so that the ultraviolet light emitting diodes in the two adjoining ultraviolet-light-emitting-diode rows form a zigzag pattern.

25 28. The ink jet recording apparatus of claim 25, wherein the ultraviolet light

emitting diodes existing on both ends of each ultraviolet-light-emitting-diode row are positioned outwardly, with respect to the length direction of the ink jet head, of ones of the nozzle hole open ends located in the endmost positions in the length direction of the ink jet head.

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29. The ink jet recording apparatus of claim 25, wherein the length, in the direction of the ultraviolet-light-emitting-diode rows, of a portion of the recording surface of the recording medium which can be irradiated with ultraviolet light emitted from all of the ultraviolet light emitting diodes is greater than the length, in the direction of the ultraviolet-
10 light-emitting-diode rows, of a portion of the recording surface of the recording medium on which recording is performed by the ink jet head.

30. The ink jet recording apparatus of claim 25, wherein a pattern mask is provided between the ultraviolet light emitting diodes and the recording medium so as to reduce
15 difference in illumination of ultraviolet light on the recording surface of the recording medium between a portion of the recording surface which corresponds to the middle position between any two adjacent ultraviolet light emitting diodes in each ultraviolet-light-emitting-diode row and portions of the recording surface which correspond to the positions of those two ultraviolet light emitting diodes.

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31. The ink jet recording apparatus of claim 25, wherein the apparatus is configured so that the ultraviolet light emitted from the ultraviolet light emitting diodes is applied via a light guiding member to the ink attached to the recording medium.

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32. The ink jet recording apparatus of claim 24, wherein the ultraviolet light

emitting diodes are disposed at least frontward of the ink ejecting portion with respect to the moving direction of the recording medium.

33. The ink jet recording apparatus of claim 24, wherein the nozzle holes are
5 formed in a nozzle plate which forms the recording medium opposing surface of the ink jet head, and

the ultraviolet light emitting diodes are disposed on the nozzle plate.

34. The ink jet recording apparatus of claim 24, wherein the nozzle holes are
10 formed in a nozzle plate which forms the recording medium opposing surface of the ink jet head, and

the ultraviolet light emitting diodes are disposed on a member other than the nozzle plate.

15 35. The ink jet recording apparatus of claim 24, wherein the apparatus is configured so that the ultraviolet light emitting diodes are placed in a case and that the ultraviolet light is emitted through a surface of the case.

36. The ink jet recording apparatus of claim 35, wherein the case is disposed so
20 that the ultraviolet light emitting surface thereof is in the same plane as the recording medium opposing surface of the ink jet head.

37. The ink jet recording apparatus of claim 35, wherein the case is disposed so
that the ultraviolet light emitting surface thereof is located closer to the recording medium
25 than the recording medium opposing surface of the ink jet head is.

38. The ink jet recording apparatus of claim 35, wherein the case is disposed so that the ultraviolet light emitting surface thereof is located farther from the recording medium than the recording medium opposing surface of the ink jet head is.

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39. The ink jet recording apparatus of claim 35, wherein the case is disposed at least frontward of the ink ejecting portion with respect to the moving direction of the recording medium, and

10 the ultraviolet light emitting surface of the case is tilted with respect to the recording medium opposing surface of the ink jet head so that the side of the ultraviolet light emitting surface closer to the ink ejecting portion is located closer to the recording medium than the opposite side of the case is.

40. The ink jet recording apparatus of claim 35, wherein the case is disposed at least frontward of the ink ejecting portion with respect to the moving direction of the recording medium, and

a light blocking member for preventing part of the ultraviolet light emitted by the ultraviolet light emitting diodes from reaching the ink ejecting portion is provided between the case and the ink ejecting portion.

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41. The ink jet recording apparatus of claim 24, wherein a heat conduction member for conducting, to the ink within the ink jet head, heat produced by the emission by the ultraviolet light emitting diodes is provided.

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42. The ink jet recording apparatus of claim 24, wherein a radiator for dissipating

heat produced by the emission by the ultraviolet light emitting diodes is provided.

43. The ink jet recording apparatus of claim 24, further comprising a discharge lamp disposed frontward of the ink jet head with respect to the moving direction of the recording medium and capable of applying ultraviolet light to an entire recording area of the recording surface of the recording medium with respect to a direction perpendicular to the moving direction of the recording medium.

44. An ink jet recording method, in which an ink jet head which ejects a UV curable ink from nozzle holes onto a recording surface of a recording medium and is capable of performing reciprocating motion in a predetermined direction parallel to the recording surface of the recording medium is used, and recording is performed by ejecting the ink from the nozzle holes onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by irradiation with ultraviolet light, at least when the ink jet head performs a forward motion of the reciprocating motion, wherein

with the ink jet head being moved, the ink is ejected from the nozzle holes of the ink jet head and primary curing of the ink ejected and attached onto the recording surface of the recording medium is performed by ultraviolet light emitting diodes provided on the ink jet head or a moving member which moves together with the ink jet head, and

the recording medium is then moved in a direction perpendicular to the direction of the reciprocating motion of the ink jet head and parallel to the recording surface of the recording medium, and secondary curing of the ink already subjected to the primary curing is performed by a discharge lamp capable of applying ultraviolet light to an entire recording area of the recording surface of the recording medium with respect to the

direction of the reciprocating motion of the ink jet head.

45. An ink jet recording method, in which an ink jet head, which ejects a UV curable ink from nozzle holes onto a recording surface of a recording medium capable of moving in a predetermined direction parallel to the recording surface and extends in a direction perpendicular to the moving direction of the recording medium, is used, and recording is performed by ejecting the ink from the nozzle holes of the ink jet head onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by irradiation with ultraviolet light, with the recording medium being moved, wherein

with the recording medium being moved, the ink is ejected from the nozzle holes of the ink jet head and primary curing of the ink ejected and attached onto the recording surface of the recording medium is performed by ultraviolet light emitting diodes provided on the ink jet head or a member disposed in the vicinity of the ink jet head, and

secondary curing of the ink already subjected to the primary curing is performed by a discharge lamp capable of applying ultraviolet light to an entire recording area of the recording surface of the recording medium with respect to a direction perpendicular to the moving direction of the recording medium.

46. An ink jet recording apparatus which includes an ink jet head whose recording-medium opposing surface that opposes a recording surface of a recording medium is furnished with an ink ejecting portion formed with open ends of a plurality of nozzle holes for ejecting a photocurable ink, and a head moving mechanism for putting the ink jet head into reciprocating motion in a predetermined direction parallel to the recording surface of the recording medium, and which performs recording by ejecting the ink from the nozzle

holes of the ink jet head onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by irradiation with light, at least when the head moving mechanism puts the ink jet head into a forward motion of the reciprocating motion,

5 wherein the ink jet head or a moving member which moves together with the ink jet head is provided with a plurality of light emitters for emitting the light to the ink attached onto the recording surface of the recording medium to cure the ink.

47. The ink jet recording apparatus of claim 46, wherein the light emitters are
10 ultraviolet light emitting diodes.

48. The ink jet recording apparatus of claim 46, wherein the light emitters are light emitting diodes containing GaN.

15 49. An ink jet recording apparatus which includes a recording medium moving mechanism for moving a recording medium in a predetermined direction parallel to a recording surface of the recording medium, and an ink jet head which extends in a direction perpendicular to the moving direction of the recording medium and parallel to the recording surface of the recording medium and whose recording-medium opposing surface
20 that opposes the recording surface of the recording medium is furnished with an ink ejecting portion formed with open ends of a plurality of nozzle holes for ejecting a photocurable ink; and which performs recording by ejecting the ink from the nozzle holes of the ink jet head onto the recording surface of the recording medium and then curing the ink ejected and attached onto the recording surface of the recording medium by irradiation
25 with light, with the recording medium being moved by the recording medium moving

mechanism,

wherein the ink jet head or a member disposed in the vicinity of the ink jet head is provided with a plurality of light emitters for emitting the light to the ink attached onto the recording surface of the recording medium to cure the ink.

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50. The ink jet recording apparatus of claim 49, wherein the light emitters are ultraviolet light emitting diodes.

51. The ink jet recording apparatus of claim 49, wherein the light emitters are light
10 emitting diodes containing GaN.